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SOME CAUSES OF INSANITY

being a

Thesis for the Degree of M.D.
University of Edinburgh

by

PATRICK STEELE,
M.B., Ch.B.

April 1908.



SOME CAUSES OF INSANITY.

It is only within comparatively recent years that insanity has been accorded its proper place in medicine - that is as a definite physical illness and one requiring therapeutic and hygienic treatment according to the various factors influencing the origin and course of the disease and the signs and symptoms to which they give rise.

In the earliest times a lunatic was merely considered as a person possessed of one or more evil spirits and was accordingly subjected to various forms of ill treatment with the object of making the existence and habitation of the spirits as unpleasant as possible and finally driving them out.

Then as civilization progressed and demonology gradually lost its hold, the few observers who have left records of their work confined themselves for the most part solely to the study of the various intellectual and mental disturbances in a case, ignoring altogether the numerous physical disorders which in many cases run a corresponding course with the mental illness. Still more recently, as asylums came to be recognised as hospitals in the fullest sense of the word, and as the means at hand for the investigation

of the more complex physiological and pathological processes occurring in disease were improved, it became evident that in many cases at any rate, the disturbance of the intellectual functions was nothing more than a sign - by far the most prominent sign - of morbid processes going on in other parts of the organism.

Unfortunately we are still in the dark, in the majority of cases, as to what these precise pathological changes are, but the modern treatment of insanity is all directed towards improving the physical health by means of rest in bed, fresh air, suitable dieting and such therapeutical measures as may be deemed necessary, and this is done because it has been found that with betterment of the physical health there is almost always a corresponding improvement in the mental state.

This statement of course applies principally to those cases of recent origin where irreparable damage has not been done to the brain substance, though even in chronic cases and cases of terminal dementia a condition of physical well being has to a certain extent an influence for good on the mental state. It is of primary importance then, in dealing with a case of insanity, that we should in the first place take a careful history of the patient's physical health both

before and during the early stages of his mental illness, and secondly make as careful a physical examination of the patient as may be possible.

These steps are taken with a view to finding any possible causes occasioning the mental disturbance and which for convenience may be briefly classified under four main headings, as follows :-

- I. Heredity.
- II. A variety of exciting causes not toxic in origin acting upon an already unstable brain condition.
- III. Toxaemia.
- IV. Combinations of any of the above.

I. Heredity.

Under this heading come these cases of

(a) Developmental Defect - where due to some defect in the growth of the foetus the higher brain centres are wanting, or if present, do not function properly.

(b) Prolonged Inbreeding - which leads to the weakening and deterioration of the stock.

(c) Developmental Defects - leading to the production of microcephalics, macrocephalics and cretins.

All or any of the above causes lead to the production of congenital imbeciles or idiots according to the degree of deficiency present.

Again developmental defect may show itself later in life by the person being more or less deficient in the power of self control. This power is one of the last acquired mental faculties and is one of the first to be lost in cases of progressive mental disease, i.e. general paralysis. This is often a potent factor in the causation of further mental breakdown, especially that caused by alcohol where the patient though knowing that he is steadily poisoning himself lacks sufficient command over himself to break off his evil habits. If the patient's power of inhibition falls below a certain point he becomes a danger to society and so is liable to be considered insane, and many of the most troublesome patients in asylums, those who on the least real or fancied injury or slight get into a violently excited and dangerous state, belong to this class.

(d) Hereditary Predisposition to Mental Disease.

This is perhaps the most common and important cause which comes under the heading of Heredity and in such cases the disease may be produced by conditions toxic or non toxic.

The frequently accepted view of insanity is that it commences with disorder of function or structural changes in the brain cells or nerve tracts, but on taking a careful history of any case where heredity is assigned as the sole cause except in the cases of

patients who come under the headings of (a), (b) or (c) it will almost invariably be found that before the onset of mental symptoms the bodily health of the patient was distinctly below the normal and that following upon this disordered physical condition the mental symptoms manifested themselves.

In other words, the patient's mental condition was unstable and the brain cells had a low resistive power and so a deterioration in the bodily health which in an ordinary person would be of little or no account, might, in a patient with hereditary predisposition, develop into a condition of insanity.

This is in accordance with the views held on the heredity of tuberculosis where we know that the man has not necessarily started life with tubercular disease but that he has inherited a constitution defective in the power of resisting the attack of the tubercle bacillus.

Dr Savage in his book "Insanity and Allied Neuroses" lays stress on the transmissibility of mental disease from parent to offspring and says that the nearer insanity is to conception the more liable is the child to be affected, and again that injuries or degenerative changes occurring in the brains of the parents at or near the time of conception are liable to lead to insanity in the child.

Given a patient with a predisposition to mental disease, heredity again plays a not unimportant part in determining what form of insanity the patient is most liable to develop. Dr Clouston lays stress on the transmissibility of the melancholic temperament from parent to child and says that in about 70% of the cases the sons inherit it from the mother and the daughters from the father (Mental Diseases, p.30). It seems quite reasonable to suppose that the same exciting cause might produce different forms of mental disorder in different persons according to their several temperaments just as alcohol affects differently constituted persons in different ways, under its influence one person becoming morose and sullen, another wildly halarious and excited and another quarrelsome and impulsive.

At the same time this assumption is not born out by the fact that the same patient may have at different times attacks of both mania and melancholia or that a patient may be depressed at one period of an attack and as the case progresses may become maniacal. It is possible, however, to explain this latter occurrence in two ways; (i.) granted that the disease is produced by a toxin either bacterial or originating in faulty metabolism, that the toxin may, when present in large amount, act as a depressant to the mental and

nervous system generally and in smaller quantity act as an excitant. (ii.) It may simply be due to a reaction, the depression giving way to excitement or vice versa before the mental condition settles down to its normal.

Under the heading of hereditary causes may be placed the question of civilization as a factor of some importance in the production of insanity.

Undoubtedly, the higher the civilization, the greater is the stress put upon the mental faculties both as regards education and in the daily work and worry of business life. Such a condition of life, when not counterbalanced by sufficient mental relaxation and preservation of the physical health by a due amount of open air exercise, tends to produce a condition of mental instability which may be passed on to succeeding generations. This is supported by the fact that the percentage of insanity among savages and the semi civilized is considerably less than among the highly civilized white races.

What may be called Racial Heredity comes into evidence in the cases of patients suffering from the two conditions, Mania and Melancholia, as may be seen in the statistical tables of various asylums.

In Irish and Highland Asylums the cases of mania of all kinds considerably exceed those of melancholia,

the patients being nearly all of the Celtic race, whereas in the Lowlands of Scotland the cases of melancholia are much more numerous than the cases of mania, excluding those of brief duration directly due to the poisonous effects of alcohol which are undoubtedly more common in the larger towns than in a scattered rural population.

II. A Variety of Exciting Causes not Toxic in origin acting upon an already Unstable Brain Condition.

In this class come those cases of insanity caused by

- (a) Exhaustion
- (b) Gross Cerebral Disease
- (c) Traumatism
- (d) Sudden Deprivation of
a Special Sense.

(a) The term Exhaustion as a cause of mental disease does not imply a breakdown from prolonged use of the higher intellectual centres, though in certain cases this might be an important factor in the causation of the disease, but a continued draining away of the physical strength as is typically seen in many women during lactation and in advancing senility in both sexes. This loss of bodily vitality acts secondarily upon a brain already predisposed by heredity and results in a mental breakdown. It appears possible, if not probable, that cases of insanity

classified by Skae as Adolescent and Climacteric may be due originally to the comparatively sudden and great changes in bodily metabolism lowering the physical condition and thus indirectly acting upon the brain.

The same may be said about the recurrent attacks of insanity which occur in pregnant women and which gradually disappear after delivery and as the patient's bodily health is again improved, only to re-appear during the next and succeeding pregnancies.

(b) Gross Cerebral Lesions - Under this heading may be placed

- i. Intracranial Growths.
- ii. Chronic Meningitis with Encephalitis.
- iii. Some cases of Vascular Degeneration.

i. Intracranial Growths.

The frequency of occurrence of cerebral tumours amongst the insane varies according to different authors from 2 per 1000 to 28 per 1000, which last is Clouston's finding. It is probably the fact that in nearly all cases of cerebral tumour there is a certain amount of mental disorder found, due either to the greatly increased intracranial pressure interfering more or less with the functions of the higher brain centres or to the interference with the blood supply to the whole brain (P. E. Knapp "Brain" 1906, p.35).

ii. Chronic Meningitis with Encephalitis.

In considering these conditions as a cause of insanity it is difficult to avoid crossing the borderline between toxic and non toxic cases, as the majority of cases of chronic meningitis are primarily caused by specific toxins, e.g. lead, alcohol, syphilis, etc., but the fact remains that there are cases of insanity fairly frequently occurring in which no toxic history can be obtained and which post-mortem show undoubted thickening and matting of the membranes with resulting encephalitis, and this in patients who have shown none of the signs or symptoms of General Paralysis. It seems worthy of note that in a number of patients whose brains have been examined post-mortem and whose cerebral membranes give evidence of slowly progressive thickening, due to any cause, there is a specially thickened and adherent area over the vertex reaching from just posterior to the fissure of Rolando almost as far as the parieto-occipital fissure.

Patients suffering from this form of insanity usually present a fairly constant train of symptoms, such as an inclination to lie curled up in bed on one side or the other, a dislike to strong light and an aimless resistiveness to any interference or passive movement. They are, besides, frequently destructive and somewhat restless.

iii. Some cases of Vascular Degeneration.

Under this heading come those cases in which we find sclerotic changes occurring in the blood-vessels, exclusive of those patients in whom arterio sclerosis has been caused by the deleterious influences of substances either absorbed into or elaborated within the system. The patients coming into this category are mostly men in advanced life, drawn from the labouring classes, who have for the greater part of their lives been engaged in hard manual labour involving continual high pressure in their arteries which in course of time tend to become rigid and calcareous. It is seldom that a pure case of this kind comes under observation as nearly all such patients are suffering from some form of chronic intoxication. Should the degeneration of the vessels be extreme or should it take the form of endarteritis obliterans a frequent result is the softening and degeneration of areas of the cerebral tissue with accompanying complete loss of function.

Such patients as a rule sleep very badly and are inclined to be somewhat noisy and destructive. Considerable motor restlessness is also a frequent and prominent symptom.

(c) Traumatism - The insanity resulting from trauma may be either epileptic or non epileptic. Of

these the latter type is, according to Clouston, the more common though Bruce denies that non-epileptic cases are purely traumatic, but with the exception that the epileptic seizures are absent from the one case the mental symptoms of such cases have much in common. They are apt to be spiteful and malicious, are morose and moody, and have little self control. Physical symptoms may develop at the same time, such as gradually increasing weakness, difficulty in speech, defective eye sight, etc., all pointing towards a progressive lesion.

(d) Sudden Deprivation of a Special Sense - Such cases are not by any means common but that they do occur there is no doubt. One such case may be mentioned here in which, though the insanity was not primarily due to loss of sight, still the occurrence caused a marked change in all the symptoms the patient presented.

The patient, an oldish man, with pathologically thickened arteries and slight albuminuria, was suffering from gradually increasing senile dementia hastened by his defective cerebral circulation. He was a quiet inoffensive patient with fixed delusions of persecution.

He had not been feeling well for some days and one morning it was noticed that he was to all

appearances quite blind (his sight had previously been good).

Within a few hours of this being noted he became extremely restless, noisy and destructive, tearing and biting all he could lay his hands on. He remained in this state for five days, at the end of which time he died from exhaustion.

When alive his fundi could not be examined, and after death no definite lesion was found.

III. Toxaemia.

With reference to the question of toxaemia as a cause of mental disease, it would appear to be best to eliminate those toxins which are definitely known and accepted as prime factors in the causation of insanity, and this can best be done by dividing them into two great groups:

(A.) Drug Toxaemias

(B.) Organic Toxaemias (Micro-
organismal and Metabolic)

(A.) In dealing with what may be called the Drug Toxaemias, alcohol undoubtedly takes the foremost place, in civilized communities at any rate, and its relationship to insanity is three-fold.

It may be

- i. The Sole Cause of the disease occurring in an otherwise healthy person.
- ii. The Exciting Cause, the predisposing cause being a bad heredity and insufficient mental stability.
- iii. A Symptom, occurring in the earlier stages of mental illness.

Clinically these first two groups may be taken together as both present the same features. Such a case may be either :-

- (a) Acute - Delirium Tremens.
- (b) Subacute - Characterized by delusions and hallucinations.
- (c) Chronic - resembling very closely some cases of General Paralysis or Secondary Dementia.

(a) Acute Alcoholic Insanity or Delirium Tremens.

In this, a very common form of mental disturbance, severe enough to be called insanity, associated with alcohol, it is open to doubt whether the alcohol absorbed is always the direct exciting cause of the resulting mental disturbance or whether it only acts by means of the profound gastro-intestinal disturbance which it produces, the result being a mal-assimilation of the food and a sudden absorption of toxic substances from the disordered digestive tract.

Thus it is very often the case that a patient who has been in the habit of taking alcohol freely and frequently without ever being actually intoxicated develops delirium under the extra strain of an accident or surgical operation. Again the attack may develop weeks after the use of alcohol has been discontinued. These two well known facts seem to point conclusively to the alcohol paving the way for an attack of delirium occurring whenever an extra strain is thrown on the patient.

A case of acute alcoholic insanity is characterized by (a) Abdominal pain, (b) Evidences of impaired digestive functions, e.g. coated tongue, heavy breath, loss of appetite and vomiting, (c) Marked tremor of the skeletal muscles.

The mental symptoms are (a) Extreme motor restlessness usually secondary to the vivid (b) Aural and Visual Hallucinations and to the (c) Delusions of Persecution which at times occur. (d) Sleeplessness is an almost invariable symptom.

(b) Subacute Alcoholic Insanity. This is a form of insanity produced either directly or indirectly by alcohol and one which is liable to be passed over, as it borders very closely upon the chronic alcoholism with its gradually increasing dementia.

It appears to be a short lived stage which some alcoholics pass through on their road to the chronic and incurable condition of mental degeneracy.

This stage seems to be most marked in the steady tipplers and may or may not be accompanied by physical signs of alcoholic poisoning such as peripheral neuritis, etc.

The patient usually shows signs of a disordered alimentary tract, as in the more acute cases, but the motor restlessness is not present to any extent though there is often some degree of impulsiveness and there are seldom if ever hallucinations, either visual or aural, present. The most typical mental signs are well marked delusions of grandeur which gradually tend to disappear as the patient's physical health improves and his supply of alcohol is cut off.

It is a very curable form of insanity and the patients do not appear to have a tendency to delirium, but if alcoholic excess is persisted in after the symptoms pertaining to this stage have disappeared, it nearly always results in degenerative changes taking place in the cerebral tissues and the patient gradually sinks into a condition of complete dementia.

(c) Chronic Alcoholic Insanity. This is the last stage of long continued alcoholic excess and is quite incurable. In such a case there are marked

cerebral degenerative changes which have been investigated by Bevan Lewis, Ford Robertson and others. These changes consist in a thickening of the dura, arachnoid and pia, which are usually firmly adherent to the calvarium and brain. There is also considerable proliferation of the neuroglia cells and disintegration of the cortical brain cells especially marked in the fifth layer.

The more common mental symptoms observable are -

- i. Marked impairment of memory at times amounting to complete loss as the case progresses.
- ii. The patient becomes degraded in his habits and at times destructive.
- iii. A marked loss of power of initiation and he gradually becomes very facile and childish.
- iv. There may be fixed delusions of grandeur of a mild type, which delusions may persist, or if the degeneration progresses, tend to die away.
- v. There is very frequently a considerable degree of irritability and a certain amount of impulsiveness.

Such a case may remain in the same condition for years or on the other hand, if the destruction of the brain cells goes on, the patient may sink into a condition of profound dementia lasting till death. Peripheral

neuritis is a fairly common complication in such cases but by no means invariable.

Some of these alcoholic dementa are very difficult to distinguish from General Paralysis in the third stage, as both diseases may run a very similar course and present very similar symptoms, e.g. the marked irritation affecting the muscles manifested by the fibrillary tremor of voluntary muscles, the typical slurring speech and the gradually progressive dementia. It is true that alcoholics do not have congestive attacks, but again some cases of general paralysis run their course without the appearance of such seizures.

Morphinism. The habit of taking morphia either by the mouth or hypodermically is most usually met with in people of the upper classes, and such cases seldom find their way into asylums.

Like alcoholism it may be merely a symptom occurring in a case of slight mental depression, but on the other hand it may be a direct cause of insanity. The disease usually commences by a break-down in physical health, the patient's metabolism being disorganized, his digestive processes upset and as a result mental depression supervenes. To combat this feeling of depression the patient has recourse to more morphia, with increasingly bad results, and so the vicious

circle goes on. Such cases are usually inveterate liars and the moral sense is dulled to a great extent. The patient is untidy and careless about his personal appearance, and, except when under the influence of the drug, is usually depressed and unsociable. Physically he is flabby, unfit for any exertion, his digestion is poor, and his pupils are contracted and react very sluggishly to light and accommodation.

Cocainism. This form of insanity very closely resembles that due to the morphia habit, but is considerably rarer.

Ether and Chloroform. When habitually taken either into the stomach or by inhalation, these drugs resemble alcohol in their effects on the patient's mental condition. When given with the intention of producing complete temporary anaesthesia chloroform is, with some people, liable to produce short lived aural and visual hallucinations and what is more important delusions of suspicion and persecution leading them to accuse the administrator or operator of assaults, etc. Fortunately such occurrences are rare.

Lead and other Metallic Poisoning. Mental symptoms sometimes occur during the course of chronic

poisoning resulting from working with metals, more especially lead. This form is characterized by severe cephalalgia, muscular twitchings and the distinctive signs and symptoms manifested by the various poisons. Such cases are probably caused not by direct action on the brain but secondarily through the endarteritis, which so often occurs, interfering with the cerebral circulation and through the chronic interstitial nephritis which is also frequently met with, preventing the proper elimination of poisonous metabolic products and also increasing in severity the thickening already present in the walls of the blood vessels.

(B.) Organic Toxaemias (Micro Organismal and Metabolic). For some time past it has been felt that the old accepted theories of heredity, sudden disturbance of the intellect following a mental shock, etc. did not seem to be a sufficient explanation of more or less suddenly occurring cases of acute insanity breaking out without many or any noticeable prodromal symptoms. Following on this felt want, and as the clinical study of mental disease was more fully and more scientifically gone into, it was noted that, as has been before mentioned, physical symptoms and signs slight in themselves but all important as

regards the future course and treatment of the case, very frequently manifested themselves before the onset of pronounced signs of insanity. It would besides appear only reasonable to infer that disordered states of other organs would exercise a deleterious effect upon that most highly differentiated and delicately organised structure, the brain.

It is well known, of course, that the more acute physical diseases caused by distinct micro-organisms and their products often react secondarily upon the brain, causing well marked, though in most cases temporary, states of insanity, quite independently it would seem of pyrexia or hyperpyrexia.

Take as an example asthenic cases of acute lobar pneumonia, which are by no means uncommon in debilitated patients. Many such cases are complicated by excited, restless delirium which is nothing more nor less than acute, usually short lived attacks of confusional mania. Another example is afforded by the low muttering delirium of typhoid.

The post mortem examinations of such cases often show no signs of gross cerebral disease such as meningitis and microscopic sections of the brain tissue show nothing except chromatolysis and diminution in the number of Nissls Bodies, and this only in cases of long standing. Another sign of interference with

the nervous system, which is often met with in pneumonia, is the loss of the knee jerks.

To what then is this interference with the nervous system generally due? Undoubtedly to a morbid state of the nerve elements brought about by some product of the micro-organisms which are the primary cause of the physical disease. Brain exhaustion is unquestionably a factor in the causation as this runs an equal course with the physical exhaustion but by itself is insufficient to account for the acuteness of the mental symptoms.

Again there are several distinct and separate physical diseases which present points of similarity to forms of mental disease. Take for instance Malaria and Relapsing Fever and compare them with Recurrent and Alternating Insanity.

In malaria and relapsing fever the onset of the attack is coincident with, and almost certainly caused by, an invasion of the blood stream by specific micro-organisms.

Why then should recurrent maniacal attacks following each other at an interval of a few days or weeks be put down to what is called a "nerve storm" and left with that unsatisfactory explanation? The well known and frequently recurring "Congestive Attacks" so common a sign in cases of General Paralysis may be

placed in the same category and in this disease the congestive attacks have been shown by Ford Robertson to be co-incident with the appearance of a diphtheroid bacillus in the circulation and cerebrospinal fluid (Morrison Lectures 1906).

There is yet another argument to advance in favour of many of the acuter forms of mental disease being due to some deleterious substance acting on the cerebral tissues and that is that the onset of a definite toxæmia of a different kind frequently, in fact in almost all cases, to a great extent modifies the mental condition existing at the time. The following are two cases illustrating this in a marked degree.

CASE I.

A. McK., male, aged 36, labourer, was admitted to the asylum in July. His history as far as it could be obtained was that until three days previously he had been working as usual but for a week or so before had been complaining of feeling 'out of sorts' and sleeping badly. Three days before admission he became restless and inclined to wander about aimlessly. This was succeeded by an acutely maniacal attack and he was accordingly certified and sent into the asylum. On admission he was shouting incoherently

singing fragments of songs and in a condition of extreme motor restlessness, throwing himself about constantly. His tongue was covered with a thick brown fur, his breath was heavy, and his bowels constipated. There was an excess of indican present in the urine but no other abnormality was found and he appeared in all respects to be a man of exceptionally powerful physique.

A week after admission while still in the same maniacal state he bit his wrist slightly, and three days later it was noticed that he had a fluctuating swelling over his right tibia and his temperature was raised to $101^{\circ}.4$ F. During that day he quietened down considerably and next day when an abscess was in process of formation in his right ankle and his temperature was 103° F. he was comparatively quiet and rational. He later developed abscesses in his left knee and both elbows, and from that time until his death, which occurred four days later, he was to all appearances perfectly sane, conversing rationally with friends who came to see him and declaring that the previous part of his illness was almost a complete blank. Both strepto and staphylo cocci were isolated from the pus evacuated from the abscesses.

CASE II.

J.T., male, aged 38, sailor, was admitted in August. No history was obtainable. On admission he was in a somewhat depressed state, unwilling to speak except to repeat over and over again that 'there was no hope for him'. Three weeks later he made a determined attempt to commit suicide by cutting his throat. After this attempt he became much more restless and depressed and could only with difficulty be kept in his bed. His sleep was very bad and he did not react well to hypnotics. One evening when struggling he abraded the skin of his left forearm and some difficulty was found in keeping a dressing on the part. Two nights later his temperature rose to 102° F. and he became much quieter. The injured forearm was red and angry looking, and there was marked lymphangitis. During the next three days he required cold sponging every two hours, as he had persistent hyperpyrexia. At this period his mental condition was quite changed. He was quiet, thankful for all that was done for him, and expressed himself rationally and without marked depression. He remained in this state until a few hours before death which occurred on the 6th day after the first symptoms of septicaemia appeared.

In 1896 Dr Keay published an account of thirty-eight cases of typhoid and six cases of scarlet fever which had occurred in the Inverness District Asylum (Journal of Mental Science, Vol.XLII., p.267). In the cases of scarlet fever three showed marked improvement, in two cases amounting to complete recovery, in their mental condition; two remained unaltered and one showed slight improvement.

In the cases of typhoid the mortality was heavy, only twenty-three cases recovering from the fever. Six of these showed marked mental improvement and were discharged cured; three improved, but did not recover, and fourteen showed no change.

Some of the patients who recovered after the attack of fever were recent and acute cases of mania and melancholia who would probably have improved in any case, but amongst the others were cases of chronic mania of as many as seven years' standing.

Although, as has been admitted, no doubt some of the more recent cases would have recovered in course of time, it is a fact worthy of note that the onset of recovery should be synchronous with the attack of fever.

Why such an attack of fever should bring about improvement, or recovery, in a mental case where the brain has not been permanently injured and how it is

brought about are questions to which as yet at any rate, no positive answer can be given.

Professor McIntosh suggested that the relief of the mental on the supervention of a physical ailment was nothing more than a mere coincidence (Journal of Mental Science, Vol.IX., p.36). This view would appear reasonable enough if such cases were few in number, but they are of common enough occurrence to raise them above the level of coincidence.

Dr C. M. Campbell expresses the opinion that the curative effect may be merely due to the increased attention and care paid to the patient (Tuke's Dictionary of Psychological Medicine, Vol.I., p.507).

Whatever might have been the case in the older days such an argument seems hardly tenable now when acute mental cases are treated in every way as hospital patients, with constant nursing and attendance, good suitable food and usually prolonged rest in bed in the open air whenever possible.

Dr Clouston suggests the toxaemic theory by attributing the beneficial effect of the fever to an alterative action stimulating nutrition (Mental Diseases, p.135).

Carrying this last statement a little further might it not be possible, if not probable, that the toxins produced by these fevers were antagonistic

to, and in some cases capable of destroying, any deleterious substance which was exercising a harmful action on the brain?

Having gone thus far, the next point to be considered is, what are the signs, if any, of poisoning by bacteria and their toxins or by the poisonous products formed by faulty metabolism and insufficient excretion which occur in cases of mental disease with the exception of terminal dementias and those under headings I. and II.

In studying the effects of poisoning by micro-organisms and their toxins, and toxins elaborated by faulty metabolism, the most definite signs are shown by

- (i.) Temperature
- (ii.) The three main excretory channels (Bowels, Kidneys and Skin).
- (iii.) The Blood.

(i.) Temperature.

This to a certain extent throws light on the possibility or probability of there being a toxic element in the more recent and acute cases of insanity.

In many cases of acute manias and melancholias, especially those with much mental confusion, the temperature is raised above normal, not to any great

extent it is true, the rise in uncomplicated cases being seldom more than one or two degrees, but on the other hand it is often of a definitely 'swinging' character and gradually settles down as the patient progresses towards recovery or towards chronicity with an incurably damaged mental condition.

This alteration in temperature is unaccounted for by any other cause. The muscular activity occurring in some excited patients is not sufficient explanation because it is at times found in stuporose, confused melancholics who lie in bed without voluntarily moving hand or foot for days and weeks. It may be said that it is merely a cerebral symptom and not due to the bodily reaction to a toxic influence, but against this can be placed the fact that in chronic lunatics, not necessarily demented, but those who have had an acute attack and have settled down into a state of weak mindedness with fixed or limited delusions, where cerebral symptoms may be just as marked as in recent cases, the temperature runs as steady a course as it does in an average healthy person.

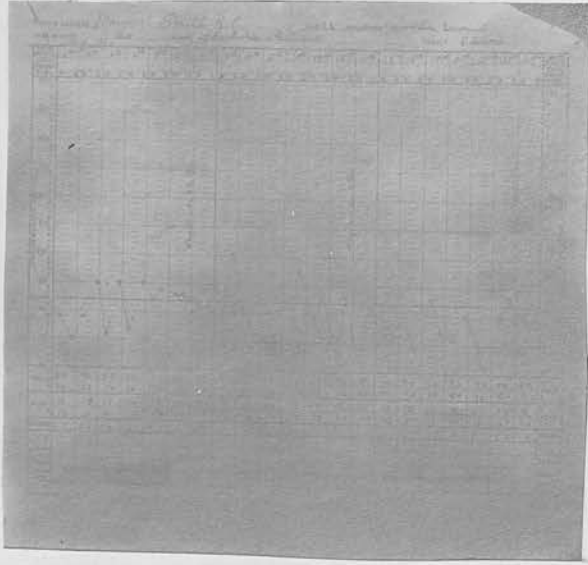
A study of a number of temperature charts compiled in the admission wards of the Edinburgh District Asylum during the past year shows no very

striking deviation from the temperature in a state of health, but there are a few exceptions of abnormal temperatures occurring when no physical cause could be found on most careful examination. Two striking features of the temperatures are, firstly, that the febrile reaction is rarely in proportion to the severity of the disease; and, secondly, that often one finds no febrile temperature combined with a high leucocytosis.

This seems to show that in many mental cases where there are grounds for suspecting a toxaemic infection of some virulence, there is often little or no corresponding febrile reaction.

On separating out the charts and classifying them according to the various forms of mental disease from which the patient was suffering, it became evident that those who showed most irregularity in temperature were those suffering from depression with confusion of ideas and gastro intestinal derangement of function. Such temperatures are characterised by (a) their marked irregularity with frequent slight pyrexias; (b) the rise in nearly all cases occurring in the evening.

The following is a typical chart of such a case.

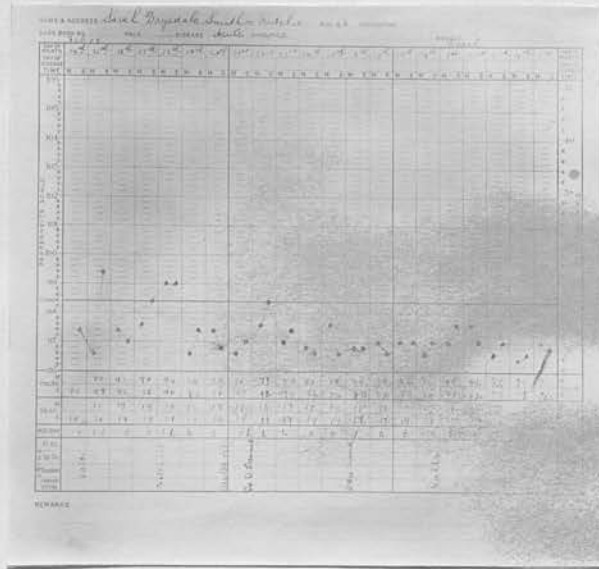


The patient was a girl, aged 22, domestic servant, in whom no trace of tubercle could be detected but who had marked anorexia, frequent vomiting of greenish-brown, foul smelling fluid and whose gastric juice was absolutely inactive in every respect.

She suffered from extreme depression with much confusion of ideas and had numerous delusions of persecution. She was treated by daily stomach lavage, predigested food and intestinal antiseptics, and rapidly improved.

In maniacal cases pyrexia, if it occurs, is usually found within the first fortnight after which,

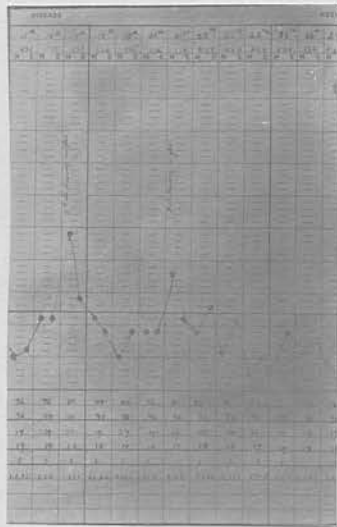
in favourable cases, the temperature tends to settle down and run a more or less steady course, as in the annexed photograph.



In acute attacks, occurring in a previously healthy person, there is generally some degree of pyrexia, but in recurrent attacks, or during an exacerbation of the disease in a chronic maniac, it is rare to find any corresponding alteration in the temperature, even though, as has been stated before, the patient may show a considerable degree of hyperleucocytosis.

In Delusional Insanity pure and simple, without either excitement, confusion or depression, the temperature shows nothing abnormal either in recent cases or in those in whom the delusions have supervened on an acute attack of mania or melancholia and signify the onset of mental weakness and impairment except that as dementia advances the temperature tends to sink below normal, and many terminal dements have temperatures running a steady course at 95° - 96° Fahrenheit.

In a few cases of non traumatic epilepsy, the occurrence of fits is marked by a transitory pyrexia, slight in some but marked in others, as the following photographs show.



(A)



(B)

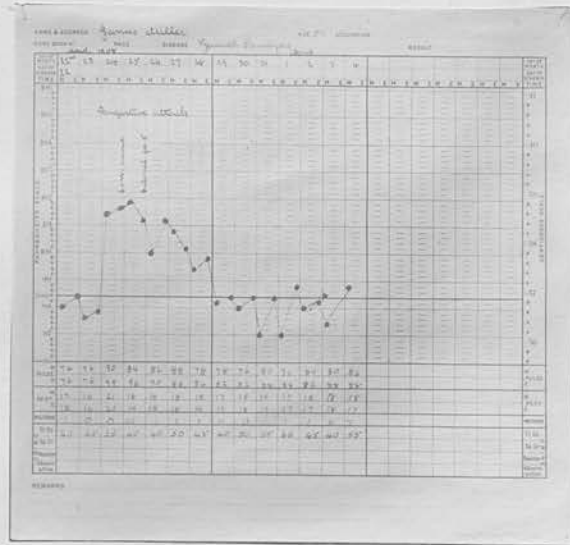
A. is a case of a congenital imbecile in whom epileptic seizures first manifested themselves after puberty and in whom the fits were comparatively infrequent.

B. is a case of an epileptic imbecile who had frequent fits, sometimes two or three a day.

In both, the epileptic seizures were almost invariably followed by a temporary rise in temperature.

Of all forms of mental disease, General Paralysis of the Insane shows perhaps the most marked variation in the body temperature. The congestive seizures, so common a feature of the second and third

stages of the disease, are almost invariably accompanied by a rise of three, four or five degrees, the temperature remaining constant for as long as the congestive attack lasts, and falling, as quickly as it rose, when the attack passes off.



To recapitulate, the rules are generally as follows:-

- (a) In Acute Melancholia with Confusion of recent origin, the temperature is irregular as long as the confusion lasts, frequently rising above normal though not to any great extent, such rises occurring generally in the evening.

- (b) In Acute Mania of recent origin it is irregular during the first fortnight or so, after which it settles down into a regular course.
- (c) Delusional Insanity shows nothing characteristic.
- (d) In Epilepsy, the fits may be followed, not preceded, by a transitory rise.
- (e) The Congestive Attacks of general paralysis are almost invariably accompanied by a considerable degree of pyrexia, the duration of the fever being the same as the duration of the attack.

(ii.) The Three main Excretory Systems.

a. Digestive System - Under this heading is meant to be included the whole alimentary tract and its three great functions of digestion, assimilation and excretion, the due performance of which is of the most vital importance with regard, not only towards the treatment of mental disease, but also with reference to its causation.

Almost without exception in acute cases of mania and melancholia the digestive system is very markedly out of order as shown by the cracked, dry lips, with sordes on them and on the teeth, a dry, brown-furred tongue with red irritable edges and a heavy foul breath, and lastly, the obstinate constipation which exists in the majority of such patients.

There are, it is true, some cases, especially of melancholia, which do not present such signs, but these cases can hardly be included under the toxaemias and their proper place is under Heading No.II.

There is one sign more often found in the toxic melancholias than in manias and that is the frequency with which the gastric juice is almost entirely inert, having, in some cases, lost even the power of curdling milk. The sordes on the lips and teeth of such cases have been shown to be composed of inspissated mucus and saliva swarming with organisms of the streptococcus group, which streptococci, when cultivated in artificial media, are very virulent to the lower animals. That they are also virulent to man is shown by the fact that very many bites, even a small scratch inflicted by such patients on the hands of nurses and attendants become septic.

As regards the saliva, it is usually diminished in quantity and is also found to be rich in streptococci most probably derived from the lips and teeth.

The gastric juice, as has been stated above, often shows great deviations from the normal, especially in acute melancholia.

A common symptom in these cases is anorexia, often complicated by the vomiting of whatever food

the patient may have been persuaded to take. The food, usually milk, is at times returned unaltered and at times curdled and mixed with brown or green foul smelling fluid.

A series of test breakfasts given in such cases and withdrawn at the end of 1 hour has given the following results. In nearly all there was a great diminution in the total acidity - some gave an alkaline reaction - and in the quantity of free HCl secreted. The pepsin was not so markedly deficient but, so far as could be ascertained, the amount was not up to the normal standard.

Except in one case there were no organic acids present, and in that case lactic acid was only found on one occasion.

There was usually an increase in the amount of mucus secreted and the brown or greenish colouring matter mixed with it gave a positive reaction to Gmelin's test for bile. All these abnormalities were much more marked in the cases of melancholia, especially those with confusion and intermittent restlessness, than in the maniacal patients.

With reference to the condition of the bowels, obstinate constipation is the rule, but there may be recurrent attacks of diarrhoea. This appears to

be more common in the cases of mania where the excitement and restlessness persist and the patient's strength is gradually brought down. The alvine evacuations of such patients show no constant abnormalities, but in two cases of acute mania under observation here, one a recent and very acute case and the other an acute exacerbation occurring in a chronic maniac, there has been temporary melaena at, or near, the beginning of the attack, for which no adequate cause could be found.

b. The Kidneys - The urine secreted by insane patients very commonly shows marked deviations from the normal, more as regards its constituents than the amount passed.

Such changes as may be present are usually more noticeable in cases of depression with digestive disturbances than in those whose chief symptoms are motor and mental restlessness.

As regards the amount secreted, there is very often much diminution, noted especially in some cases in which there is a marked discrepancy between the amount of fluid ingested and the amount excreted. Bruce has drawn attention to this point (Clinical Psychiatry, p.66) and has come to the conclusion that the water absorbed has been in some way broken up in

the system, and to support this theory cites cases, which have died of acute melancholia, in which the tissues were found, post-mortem, to be unusually dry.

With reference to the chemical constituents of the urine, marked abnormalities are noted in a majority of cases, differing according to whether the case is one of mania or melancholia.

In melancholia, especially that form associated with stupor or confusion, there is almost always a great deficiency in the output of urea, the excretion of which may be only one half or one third of what should be normal according to Haig's formula, this deficiency gradually becoming less marked in a favourably progressing case.

At the same time there seems to be as a general rule some deficiency in the output of chlorides, but not to any marked extent.

The excretion of phosphates in cases under observation here showed no constant abnormality.

In many cases of simple mania the conditions found are quite different, the urea excreted being greater in amount than is accountable for by the albumen ingested, but the intake and output gradually tend to balance themselves as the case improves.

A slight degree of albuminurea is common enough to be considered the rule in the earlier stages of

maniacal cases.

In both class of cases, but especially in the melancholias, the amount of indican is very frequently largely in excess of what is usually present, this in all probability being due to the deranged condition of the intestinal tract.

With reference to the question of micro-organisms in the urine, only one of the cases under observation recently has shown anything worthy of note. In it, a case of stupor with intervals of acute depression, a few organisms closely resembling, if not identical with, the bacillus coli communis were found. In no cases of general paralysis were bacilli found.

c. The Skin - A dry, harsh condition of the integumentary system is often noted in cases of melancholia where there is deficient excretion of the waste products of the body. Together with this there is a typical 'muddy' tinge of the complexion, resembling, yet differing from, the earthy tinge seen in cases of syphilis or cancer.

Sweats may occur during the progress of a case of mania. Blotchy, erythematous rashes also occur at times in the same cases, but the eruption most commonly seen is a pustular one breaking out in the form of boils, either singly or in crops.

The appearance of such an eruption is usually coincident with some degree of improvement in the patient's condition.

(iii.) The Blood.

Systematic and long continued blood examinations of the insane have yielded a rich harvest of facts, many of which are at present unexplainable. For instance, the coagulation time of the blood has been shown to be much delayed in states of acute mania and katatonia. Especially is this the case in the stage of katatonic stupor, where coagulation may be delayed for twenty or thirty minutes.

Again, the serum of some cases of mania has a haemolytic action on the red blood corpuscles of other insane patients while control serum has none, and at the same time the insane serum has no action on the control corpuscles.

These reactions are certainly departures from health, but so far cannot be explained. In dealing with the cases under observation here during the past year the examination of the blood has been confined entirely to noting the variation in number and characters of the leucocytes during various stages of the disease and in comparing the results so obtained with those found in health. As far as possible all cases

reported upon were those in which there was no gross lesion in the physical condition which would tend to interfere in any way with the counts made.

The normal standard was taken as given in Hutchison and Rainy's 'Clinical Methods', i.e.

- I. Total number of leucocytes per c.mm. = 7,000.
- II. Percentage of different forms of leucocyte:-

(a) Polymorphonuclear	70%
(b) Lymphocytes	22-25%
(c) Large Mononuclears	2-4%
(d) Mast Cells	0.5%
(e) Eosinophiles	2-4%

The numerical counts were made with a Thomas-Zeiss haemocytometer, and for the differential, films were stained and fixed by Gulland's method and examined under an oil immersion lens.

The leucocyte counts made in cases falling under headings I. and II. do not call for any comment, as in no case examined did the count differ to any extent from the normal.

In insanities the result of alcohol and drug toxæmias, so far as has been observed, there is no hyperleucocytosis, but these observations do not include cases of delirium tremens as no cases of that type have been admitted.

On examining the results obtained from cases falling under the heading of Organic Toxaemias, they can be separated into two groups as follows:-

- (i.) Those in which there is a definite leucocytosis combined with deviations from the normal in the percentage composition.
- (ii.) Those in which there is no leucocytosis but frequently a diminution in the number of leucocytes combined with an abnormal percentage composition.

(i.) Into the first group come all the cases of simple excitement with confusion but without depression, in other words patients suffering from attacks of mania either recurrent or of recent origin. In recent cases there is a high leucocyte count from the beginning which may fall as the case improves but rises again as recovery progresses and remains persistently high even after recovery.

The leucocytosis may be as high as 20,000 to 30,000, but usually runs between 10,000 to 14,000 per c.mm.

In the differential counts the lymphocytes and large mononuclear cells do not appear to undergo any change in number or character, but the polymorphonuclear cells are increased in number at the start and gradually tend to fall to normal, while in a case

which progresses towards recovery there is a steady increase in the number of eosinophiles, this eosinophilia remaining high after the patient has recovered.

If the case is not doing well but appears to be passing into a condition of chronicity or dementia, the leucocyte count remains low and there is little, if any, eosinophilia.

The following counts were made from a typical case of simple mania of recent origin which resulted in complete recovery :-

M.B., admitted October 27th, 1907, aged 20 years.

On admission she was excited, restless and confused. Her teeth and lips were covered with scordes and her tongue coated.

Her physical condition was otherwise good, except that her pulse was quick and rather high tension.

The blood count taken showed

(1) Red Blood Corpuscles	3,350,000
(2) White Blood Corpuscles	11,245

Differential Count:-

(1) Polymorphonuclears	75%
(2) Lymphocytes	21%
(3) Eosinophiles	4%
(4) Large Mononuclears	1%

The patient was put on a light fluid diet with intestinal antiseptics and saline purges every third

morning, and slowly improved, becoming less restless and noisy.

A blood count taken eight weeks after admission was as follows:-

(1) Red Blood Corpuscles	3,300,000
(2) White Blood Corpuscles	14,875

Differential Count:-

(1) Polymorphonuclears	55%
(2) Lymphocytes	22%
(3) Eosinophiles	21%
(4) Large Mononuclears	2%

On her discharge, which occurred ten weeks later, another count was made which almost exactly tallied with the above.

In recurrent cases the leucocyte count tends to fall just before the onset of an attack and in most cases rises slightly as the acute symptoms pass off. In these cases the numerical counts do not show such marked changes as the differential. At the beginning of the attack the most noticeable feature is the complete absence of eosinophiles; the polymorphs are not much changed in number, but their nuclei are larger than normal.

As the acute symptoms pass over and recovery sets in there may or may not be a rise in the total number, but there is nearly always an eosinophilia

noticeable and the polymorphs show a tendency to take on the characters of eosinophiles, especially in the size and colour of their granules. This eosinophilia does not last for any length of time, especially in those cases in which the maniacal attacks recur in rapid succession.

The following counts were taken from a patient who had attacks of acute mania about every sixth week, the attack lasting on an average five days.

(a) Count made on the first day of acute attack.

Patient very excited, restless and noisy. Quite unconscious of her surroundings. Pupils dilated and insensitive to light.

(1) Red Blood Corpuscles	5,750,000
(2) White Blood Corpuscles	6,750

Differential Count:-

(1) Polymorphs. (granules faintly staining)	70%
(2) Lymphocytes	22%
(3) Large Mononuclears	8%
(4) Mast Cells	.6%

No Eosinophiles could be found.

(b) Count made on fourth day of attack. Patient in same condition.

(1) Red Blood Corpuscles	5,500,000
(2) White Blood Corpuscles	6,125

Differential Count:-

(1) Polymorphs (granules deeply staining)	40%
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(2) Lymphocytes	28%
(3) Large Mononuclears	15%
(4) Eosinophiles	17%

Fifteen hours after this count was made the patient commenced to recover and was comparatively well in twelve hours.

(c) Count made six days after termination of attack.

(1) Red Blood Corpuscles	4,700,000
(2) White Blood Corpuscles	5,625

Differential Count:-

(1) Polymorphs (faintly staining granules)	33%
(2) Lymphocytes	25%
(3) Large Mononuclears	25%
(4) Eosinophiles	26%

This was the only case, with the exception of one chronic melancholia, where any striking abnormality in the number of large mononucleated cells was noted.

(ii.) Into the second class, i.e. those cases where there is no hyperleucocytosis, come the patients suffering from melancholia with confusion or with some degree of stupor associated with a deranged digestive system and mal assimilation of food. To this rule there are, however, some exceptions, notably cases of acute excited melancholia with great restlessness. These patients at times show a high leucocyte count

though not to the same extent as the maniacal cases. On the whole, however, the rule seems to hold good that with marked disturbance of the gastro-intestinal tract and mental depression there is no hyperleucocytosis but on the contrary a diminution in the total number of leucocytes per c.mm.

In a favourable case of this sort the leucocyte count rises in proportion with the improvement in the patient's physical health, and with this total rise there is a corresponding rise in the percentage of eosinophiles. The polymorphonuclears do not appear to change to any appreciable extent - though they may be below normal - except in cases merging into chronicity, when they as a rule fall considerably below the average and remain low.

The following are two of the most typical cases which have been recorded here.

Case I.

M.S., aged 23 years, admitted November 2nd, 1907.

On admission was depressed, very resistive and at times stuporose. Digestive power of gastric juice as ascertained by test breakfasts practically nil. Occasional eructations of brown, ropy, foul smelling fluid.

Blood count made day after admission showed:-

(1) Red Blood Corpuscles	3,400,000
(2) White Blood Corpuscles	5,937

Differential Count:-

(1) Polymorphonuclears	64%
(2) Large Mononuclears	4%
(3) Lymphocytes	32%

No eosinophiles were found in the film.

The patient was treated by stomach lavage, small doses of calomel and predigested food, and improved considerably. The vomiting stopped, the gastric juice became much more active, and the patient gained weight.

A blood count made six weeks later showed:-

(1) Red Blood Corpuscles	4,500,000
(2) White Blood Corpuscles	7,328

Differential Count:-

(1) Polymorphonuclears	70%
(2) Large Mononuclears	2%
(3) Lymphocytes	21%
(4) Eosinophiles	6%

After this the improvement was not so rapid but still continued, and by degrees the patient was able to digest and assimilate light diet.

The last count made showed very little except that the polymorphs were not so numerous and the lymphocytes had increased in number. The eosinophiles had increased to 8%.

Case II.

J. McR., aged 27 years, admitted June 14th, 1907.

On admission the patient was extremely depressed and confused. He was acutely suicidal and very restless and agitated. His mouth was in a very dirty condition and his tongue coated with a thick brown fur.

A blood count made two days after admission showed:-

(1) Red Blood Corpuscles	3,200,000
(2) White Blood Corpuscles	6,250

Differential Count:-

(1) Polymorphonuclears	75%
(2) Lymphocytes	23%
(3) Mononuclears	2%
(4) Mast Cells	.5%

No eosinophiles were seen.

The patient was treated with small doses of calomel and large saline enemata every morning and improved rapidly. Six weeks after admission the blood count was

(1) Red Blood Corpuscles	4,300,000
(2) White Blood Corpuscles	11,250

Differential Count:-

(1) Polymorphonuclears	60%
(2) Lymphocytes	22%
(3) Large Mononuclears	4%
(4) Eosinophiles	13%
(5) Mast Cells	1%

Two weeks later the patient was discharged recovered, but unfortunately no count was made before his discharge.

In general paralysis there is always a hyperleucocytosis accompanying the so called congestive attacks, and as the attack passes off there is a transient eosinophilia with an increase in the number of lymphocytes.

In epilepsy the results obtained have been confusing, the same patient showing at times a high leucocyte count during a series of fits, while at other times there is no noticeable difference in the counts during the attack and those taken when the patient was, comparatively speaking, well.

In secondary dementia and in the chronic delusional cases, the blood counts show nothing worthy of note.

These changes in the constituents of the blood appear undoubtedly to point to an effort on the part of the organism to combat some deleterious or toxic substances which act injuriously on the bodily condition, but so far, except perhaps in the case of General Paralysis, these harmful products either organismal or metabolic have not been isolated.

In the cases with hyperleuccytosis it appears possible, if not probable, judging by what is known of other bacterial diseases, that a micro organism acting on an already unstable nervous system is the exciting cause of the mental breakdown, while in the other cases it would appear not unlikely that the patient is steadily poisoned by the absorption of toxins produced by faulty metabolism.

The question then rises as to where these deleterious substances are formed and how they gain entrance into the system.

Judging by the bad condition in which the digestive tract is almost invariably found, it would seem very likely that the toxins are produced in it, and may be absorbed owing to the lowered power of resistance. In some cases it is found that the removal of carious teeth and the use of antiseptic mouth washes improves the patient's mental condition, so that possibly the bad teeth may be foci of infection and at the same time tend to upset the patient's digestive system and so lead to a further manufacture of toxins.

It is a debatable point as to whether the respiratory passages afford entrance to the harmful substances. Probably the only class of cases in

which this is at all likely is that known as Phthisical Insanity, but whether the phthisis is a cause of the mental illness or merely a result of lowered vitality allowing the invasion of the tubercle bacillus is not clear.

In puerperal insanity there is little doubt that the raw surface in the uterus affords a site for the manufacture and absorption of poisonous materials.

Summing up the results of the observations made during recent years, it seems at least probable that acute maniacal states either recent or recurrent are due to the invasion of a micro organism and the dissemination of its toxins, and that melancholia, especially that form with confusion and stupor, is due to the direct absorption and deficient elimination of toxins the result of bad metabolism, elaborated somewhere in the alimentary tract.

The future treatment of insanity will probably all be directed towards combating these harmful substances, either by attacking them directly, or by raising the patient's power of resistance and so enabling him to overcome them.